Al.1.1495
C-2

THE Engineering In Agriculture NEWSLETTER

FALL 2000

"More News from the Branch"

Rick Atkins, Head, Agricultural Engineering Branch

Associated with the recent change to our branch name, we have also taken a serious look at the current and future functions of the Alberta Farm Machinery Research Centre. The Centre has expanded beyond applied research and development of farm machinery. Most of the work is targeted at technology development related to crop and livestock production systems. Environmental sustainability and resource stewardship are key to many applied research and development projects conducted at the Centre each year.

To reflect this trend, we have changed the name to the "Agricultural Technology Centre." We are certain the new name and direction will attract a broader base of clients and the resulting information will apply to more producers throughout the province.

We also hired additional staff. Sherry Perih, our new Livestock Systems Engineer, comes to us from the Prairie Swine Centre in Saskatoon. As a graduate from the University of Saskatchewan in Agricultural and Bioresource Engineering, Sherry brings research experience and a great deal of enthusiasm to our Livestock Engineering work unit. Working out of the Red Deer office, Sherry's work will focus on developing and evaluating new plans, production methods, and technologies to improve livestock production while addressing animal welfare and environmental concerns.

AGRICULTURAL TECHNOLOGY CENTRE
ALBERTA FARM MACHINERY RESEARCH CENTRE

Alberta
AGRICULTURE, FOOD AND RURAL DEVELOPMENT
Engineering Services

The purpose of this newsletter is to advise of activities and projects being conducted by Alberta Agriculture, Food and Rural Development's Agricultural Engineering staff. For further information on these projects and other engineering related activities contact:

Lethbridge	(403) 381-5112	Airdrie	(403) 948-8525
Red Deer	(403) 340-5322	Vegreville	(780) 632-5400
Barrhead	(780) 674- 8256	Fairview	(780) 835-2291
Edmonton	(780) 427-2181	Lethbridge (ATC)	(403) 329-1212

Printed on Recycled Paper

Published by Agricultural Engineering, Technical Services Division, Alberta Agriculture, Food and Rural Development.

Animal Welfare and Agricultural Engineering

Robert Borg, Agricultural Engineer, Red Deer

The Canadian Expert Committee on Farm Animal Welfare and Behaviour recently met in Guelph, Ont. to discuss research priorities. Most of the emerging issues have engineering implications associated with the design of barns and other facilities used for housing and handling livestock. Issues rated as high priority for future work in Canada include:

- **Management of loose housing of dry sows.** Most swine gestation barns house sows in individual stalls for better feeding control and less aggression toward younger pigs. However, the overall perception is that this is not animal friendly. Engineering input is needed for alternative designs that will work as well as individual stalls.
- **Effects of increasing farm size on animal welfare.** Larger barns and feedlots need to be designed to facilitate good animal care.
- **The reduction of antibiotic use** by improving animal housing, management and welfare.
- **Resting times for long transportation.** Transport design also includes proper space allowances for prevention of injury and good environmental control.
- **Vehicle design for spent laying hen transport.**
- **Pre-slaughter management.** This will include good handling facility design.

At the expert committee meeting, a position paper was presented on behalf of CSAE/SCGR (Canadian Society for Engineering in Agricultural, Food and Biological Systems) regarding the Codes of Practice for the care and handling of farm animals. These are voluntary codes developed by industry groups. It is the intent of the Society that facility design is not a constraint to animal productivity and care, and that the Society supports their continued development.

Other current developments include changes in the housing of chickens, swine and cattle handling, and dairy housing research.

Several countries are re-evaluating issues such as loose or open housing for laying hens as opposed to caged layer housing. The occupational health implications for workers due to poor air quality in aviary type barns, and the stress caused from bending down to pick up stray eggs have become important issues. The Roslin Institute in Britain has developed a new cage design that holds five laying hens, and offers separate areas for perching, dust bathing, and egg laying. Sweden has changed its position on cage housing based on this research.

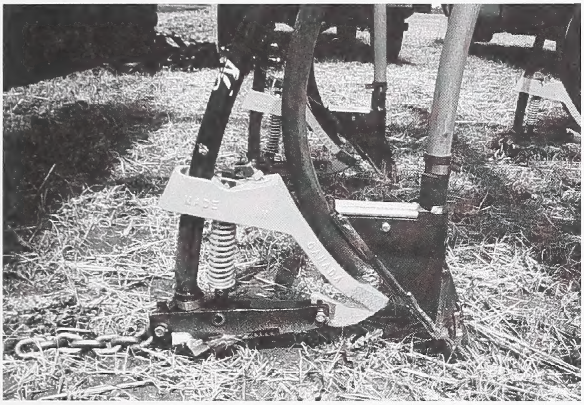
The fast food chain McDonald's has announced that it will not buy eggs from its 27 US suppliers unless they increase the cage size to 72 square inches per bird (up from 50 square inches). They will also discourage the practice of beak trimming. This will undoubtedly lead to huge housing implications. McDonald's is also having a large impact on the design and management of facilities used to handle cattle. They have set out requirements for beef and pork producers to improve the handling of animals prior to slaughter.

Canadian research is having an impact on dairy housing. The Animal Welfare Department of the University of British Columbia has completed an evaluation of various dairy stall surfaces. Current design research is evaluating the length, width and height of stalls so they are not a constraint on the welfare and comfort of the cattle.

New Opener Project

Lawrence Papworth, Project Engineer, ATC, Lethbridge

The Agricultural Technology Centre (ATC) has recently started an evaluation of openers for air drills and air seeders. The last evaluation was completed in 1995 and several new openers and seeding systems have been developed in the past few years. This evaluation involves field operation, soil bin testing, and tests for power requirements in the field. Seeding completed in the spring of 2000 was into very dry conditions, so fall crops will also be seeded. The evaluation report will be completed in early 2001. Openers and systems included in the evaluation are as follows.



The Burr Packer System

Burr Packer System: The Burr Packer System is an opener and a packing system. The system consists of a knife opener that places the seed, and a burr to push the soil around the seed and pack the soil. Fertilizer can be placed behind the burr and is incorporated in the soil with a chain. The Centre completed development work on this system four years ago.

Key Ag Ventures Coulter: The Key Ag Ventures coulter is a conventional coulter that can be used for residue cutting, fertilizing, and seeding. The difference with this coulter is the trip mechanism, which consists of a torsion bar placed horizontally above the coulter blade.

Key Ag Ventures Sweep with Back Swept Knife: This is a pair row double shoot type opener, whose system consists of a sweep opener and a backswept knife. The sweep makes a furrow for the seed while the backswept knife follows and places the fertilizer deeper. This system has been modified since it was tested in 1995. The sweeps are now cast metal and the backswept knife runs shallower.

HarvesTechnologies CB12: The CB12 is a pair row single shoot opener. The total width of the two pair rows is 4 inches, and all the leading edges of the opener are carbide.

HarvesTechnologies CB15: The CB15 is a side place double shoot opener. Seed is placed behind the main knife, and the fertilizer is placed to the side by a wing. The fertilizer is placed at the same depth or shallower than the seed. All the leading edges of the opener are carbide.

Gray Seeding System: The Gray Seeding System is a pair row double shoot type opener that bands the fertilizer below the seed. The opener consists of a front fertilizer point and a packing plate. The plate pushes the soil around the fertilizer and makes the furrow for the seed. This system is quite similar to the Anderson opener. Shank mounted packers were also supplied with the Gray openers.

"Hands on Solutions"

Suzanne Randall, ILO Information Specialist, Red Deer

"From the plenary sessions on key topics that included producers as speakers, to the tour, to various other programs and sessions, this conference was extremely well rounded catering to an entire spectrum of issues. It was gratifying to see all factions of the industry together to address a common concern." Quoted by a delegate at Manure Management 2000 Conference.

Held June 26 - 28, 2000 at the Coast Plaza Hotel in Calgary, this conference was designed with the

(continued)

producer in mind. More than 350 delegates received accurate and timely information on issues surrounding the livestock industry.

The first evening showcased the **New Technologies and Ideas Market**. Forty posters were on display, highlighting practical research producers can use to manage manure on their farms. Authors were on hand to discuss useful technologies with producers.

Think Global; Produce Local, the conference's opening plenary session, featured three producers who spoke on the global view as it relates to the livestock industry. Speakers explained how producers can help each other by: being pro-active, being accountable to industry and each other, understanding the changes in industry and our communities, and by taking care of business at home, with the global market in mind.

Conflict specialist Barb McNeil presided over **From Conflict to Cooperation**. This interactive session covered the principles of preventing and resolving conflict, and helped to create awareness and understanding. Many issues lead to conflict and producers need to understand both sides of the story. McNeil believes that communication is an effective conflict resolution tool.

Delegates boarded chartered buses for a **Site Tour and Demonstration** to see how other livestock producers are managing their manure, maximizing nutrient use. Participants visited a feedlot manure composting site, observed demonstrations on several different types of manure application equipment, and had an opportunity to find out more about odour evaluation and nutrient testing. They also evaluated the siting of a 5,000 head feedlot, and visited field plots where liquid and solid manure have been applied.

An informative panel session, **Regulations and the Livestock Industry**, was held on the second evening. Presenters included representatives from the livestock industry, municipal and provincial governments, environmental organizations, academia, and agricultural law. Speaker John Kolk, and others, echoed the consensus that *"ILO standards and regulations must be in place to allow the industry to move forward in an environment conducive to responsible and accepted business practices"*.

Hands On Solutions
Manure Management
2000

The **Manure Management Program** featured a full morning on 'how to' maximize the nutrients in manure. Producers spoke on how they currently manage manure on their farms, what is the cost, where are the savings, and what is the effect on the bottom line. Researchers shared their views on how to use nutrients effectively, save money on purchased fertilizers, the composition of manure, and how to turn waste into profit.

The **Odour Program** discussed odours: what are they, where do they come from, and what are their effect on people and animals? Researchers and industry shared their views on how to deal with odour complaints, while producers shared farm solutions for their control.

The afternoon **Breakout Sessions** gave participants an opportunity to ask questions and participate in discussions. Seventeen concurrent breakout tables, which covered 14 different topics, were facilitated by producers, an agricultural lawyer, livestock industry representatives, consultants, and government agencies.

The conference was an opportunity for producers, industry, researchers, academia and government agencies spanning the prairie provinces to gather and network on the topic of manure management.

As stated by this delegate, *"I was originally going to pass on the conference, but am glad I didn't as I learned a lot from the interaction with producers who are practicing good manure management. It was a very good conference with timely topics. I definitely plan to attend future conferences."*

Thinking of attending the conference next year? Mark your calendar for June 26 - 28, 2001 in Winnipeg, Manitoba. The Manure Management 2001 Conference, entitled "Livestock - Options for the Future" will focus on the environment, communities and knowledge. It will combine two days of presentations, workshops and discussion groups with tours, to showcase technologies that address the environmental concerns with the livestock industry in Western Canada.

For proceedings and details of the Manure Management 2000 Conference, visit our web site at: www.agric.gov.ab.ca/manure2000/. You'll find speaker presentations, poster highlights, tour information, photos and much more.

Farmers Talking to Farmers

Murray Green, Farm Machinery Specialist, Airdrie

The Alberta Conservation Tillage Society (ACTS), in partnership with industry and government, has introduced a new program called "R T Linkages." This program is the follow-up to the reduced tillage program known as ARTI, and is designed to help farmers share information with each other about cropping methods and things they will need to do for a secure future.

The Agricultural Engineering Branch is a long-term partner of ACTS, industry, and farmers, as its project engineers do research and provide information about the equipment and systems required for reduced tillage and direct seeding. Current research is targeted at fine tuning ground opener spacing and the width of the seed row itself. Fertilizer placement location is included as an important factor. The ideal answer to these questions will provide maximum income for the money invested in inputs. Lowest equipment cost and reliability of the system to produce good initial crop stands, will also be a measure of the best system. Other studies underway at the Agricultural Technology Centre involve the control of pesticide spray drift, use of manure in crop production, and the impact of various farm operations on the environment.

The R T Linkages program, when up and running, will quickly move information and feedback from farmers and other agricultural specialists to the Agricultural Engineering Branch, so that engineers may respond with fast track research to meet farming needs.

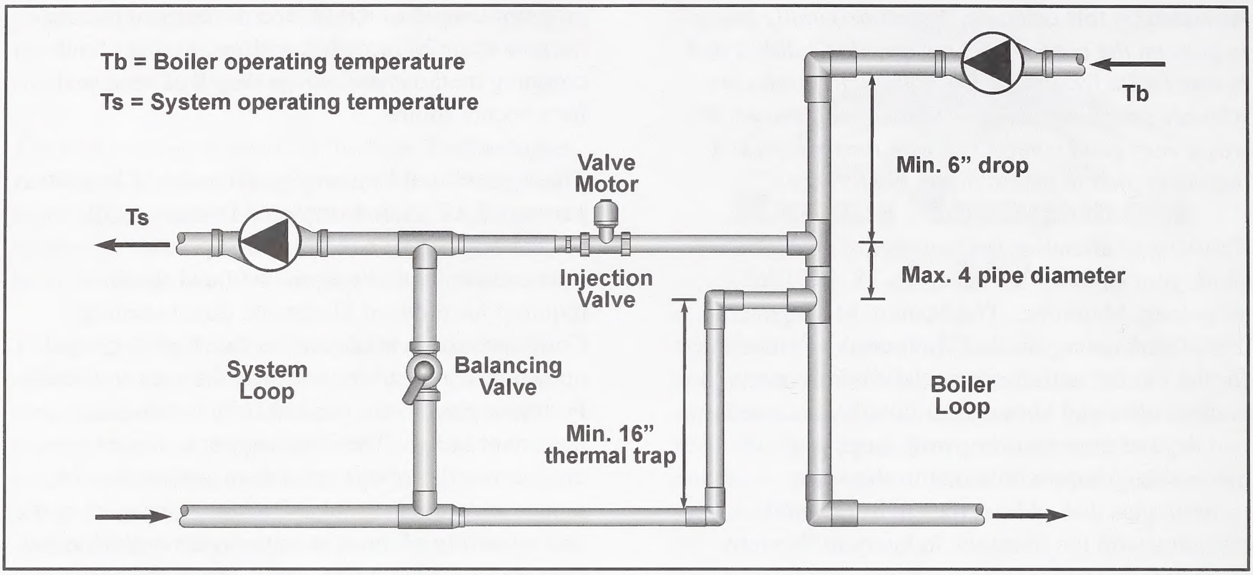
Hot Water Heating Update

Dennis Darby, Farm Structures Engineer, Lethbridge

For the past three decades, hot water heating has been a practical and efficient heating method for farm buildings. It is particularly effective for large multi-room facilities, like piggeries and processing buildings, and has been the prime choice for many farm shops.

New technology in the past five years has revolutionized hot water heating. The Livestock Engineering Unit of the Agricultural Engineering

(continued)



Injection Mixing System

Branch, in cooperation with industry, has just finished updating their popular Canada Plan Service bulletin *Hot Water Floor and Space Heating* to reflect this changing technology.

As with residential plumbing, the hot water heating (Hydronic Heating) industry has moved to computerized controls and mostly plastic plumbing. Listed below are some major improvements and features to look for.

Heating several zones, at different temperatures, from one source is now easier than ever. Solid state, computer-based "smart controllers" integrate boiler performance with the demands of various heating loops in the system. It is now common to have several baby pig rooms, weaner rooms, and floor heat on one system.

New PEX piping is far superior to old poly or gray plastic systems. PEX stands for "cross-linked polyethylene." For hot water applications, PEX piping with an oxygen barrier, to keep oxygen out of the system, is recommended.

Floor heat requires much lower temperature water than space heat (40° vs. 85°C). Injection mixing water from the "hot circuit" into the floor loop is the latest technology for multi-zoned systems (see diagram). The injection device (an on/off zone valve) injects short bursts of hot water into the constantly circulating secondary loop. A "smart controller" integrates this process with the boiler control and other demands on boiler heat. The secondary loop has its own circulation with head and flow rates specifically designed for that circuit. The primary circuit flow remains constant. Injection mixing provides accurate and variable temperature control, but does require proper piping arrangement and balancing.

Solid state control packages are compact in size, fully integrated, and easy to connect. This technology also provides for more effective and efficient systems. Some efficiencies include:

- modulating heater controls,
- outdoor reset for optimum boiler firing rates,
- variable speed pumps for optimum flow control for secondary circuits.

We're on-line!
www.agric.ab.ca

Intensive Livestock Operations Update

Alberta Agriculture, Food and Rural Development (AAFRD) staff and industry are preparing the following initiatives to ensure the responsible development and operation of the intensive livestock industry.

A revised, voluntary *Code of Practice for Safe and Economic Handling of Animal Manures* is being developed. This document provides technical guidelines for the siting of new and expanding livestock operations.

The development of commodity specific *Best Management Practices* (BMP) manuals. These manuals provide producers with management options to achieve outcome-based provincial standards. At present, Alberta Pork and the Alberta Cattle Feeders Association are working with department staff to develop guidelines for the pork and feedlot industries. The Alberta Chicken Producers have agreed to move forward with BMPs, and the Alberta Milk Producers have also expressed an interest for their industry.

The Alberta Cattle Commission and department staff are working on a new publication that will address issues surrounding wintering sites.

Environmental self-assessment and certification programs to voluntarily identify and remedy on-farm problem areas are being investigated. Voluntary certification programs used in other jurisdictions in Canada and the United States are being evaluated for use in Alberta.

A proposal has been put forward by AAFRD and the Intensive Livestock Working Group (ILWG) for the development of a peer review process for addressing public complaints related to livestock operations.

Research to improve manure management practices and the construction of manure storage facilities is underway. Ongoing research projects include: developing soil phosphorus limits, evaluating manure application, odour control technologies, and seepage studies for earthen manure storages.

Nutrient management planning tools, such as a manure calculator and a nutrient management curriculum are also in development. On-line extension tools are available at the following web addresses:

Manure Happenings - **www.fbminet.ca/manure**
Ropin the Web - **www.agric.gov.ab.ca.**

Ag Summit 2000, which concluded in June 2000, provided a sounding board for land use and livestock development issues. Feedback from the Summit will assist in policy and program development to ensure the sustainable development of the livestock industry.

The ways in which various government departments cooperate in relation to intensive livestock operations will also be clarified. AAFRD will continue to work with industry and other stakeholders to provide the livestock industry with tools for sustainable development and to assure it continues to be a player in Alberta's economic success.

For further information regarding the activities and initiatives in the Intensive Livestock Operation (ILO) area, contact the people listed below.

Louise Starling
Acting Director, Technical Services Division
Alberta Agriculture, Food and Rural Development
Phone: (780) 427-0674 in Edmonton, or
Phone: (403) 340-5306 in Red Deer

Darcy Fitzgerald
Acting Unit Leader, Livestock Expansion and Development
Alberta Agriculture, Food and Rural Development
Phone: (403) 340-4822 in Red Deer, or
Phone: (780) 422-2522 in Edmonton

Note from the Editor
The article "Row Spacing Results", which appeared in the Spring 2000 issue of the Engineering in Agriculture Newsletter, contained an error. The diagrams were mislabeled. The correct version appears on our web site at the following address:
www.agric.gov.ab.ca/engineer/enginagindex.html
Our apologies to Lawrence Papworth, the author.

National Library of Canada
Bibliothèque nationale du Canada
3 3286 52208435 5